

REMARKS/ARGUMENTS

Information Disclosure Statement

Applicant submitted an Information Disclosure Statement (IDS) on 12/10/2004 in relation to the present application. A copy of the original IDS and accompanying transmittal letter are attached. Thus far in the prosecution of the present application, the Examiner has not indicated that she has considered the references contained in the IDS. Applicant respectfully requests the Examiner to include in the next Office Action an initialed version of the IDS indicating the Examiner has considered the references contained in the IDS.

In the Office Action, the Examiner noted that claims 1-30, 34-39 and 45-50 are pending in the application. The Examiner additionally stated that claims 1-30, 34-39 and 45-50 are rejected. By this amendment, claims 31-33 and 40-43, which were previously canceled are now re-presented, claims 1, 6, 8-10, 12, 15, 22, 24-25, 28, 31-32, 36, 39, 45, and 48 have been amended, and new claims 51-70 have been added. Hence, claims 1-43 and 45-70 are pending in the application.

Applicant hereby requests further examination and reconsideration of the application, in view of the foregoing amendments.

In the Specification

In the specification, the table on page 1 has been amended to identify the co-pending applications by their serial numbers.

In the Claims

Rejections Under 35 U.S.C. §103(a)

The Examiner rejected claims 1, 2, 15-30, 34-39, 45, 48, and 50 under 35 U.S.C. 103(a) as being unpatentable over Emma et al., U.S. Patent No. 5,353,421 (hereinafter *Emma*) in view of Hughes et al., U.S. Patent No. 4,200,927 (hereinafter *Hughes*). Applicant respectfully traverses the Examiner's rejections.

First a discussion of *Emma* and *Hughes* is helpful. *Emma* and *Hughes* are directed to the IBM System/370 processor. See for example, *Emma*: col. 13, line 9-10; *Hughes*: col. 1, lines 14-17, col. 6, lines 12-20, col. 10, lines 62-66, col. 11, lines 46-50. *Emma* specifically states that neither the branch prediction mechanism of *Hughes* nor the DHT of Losq et al. (the DHT employed by *Emma*) attempt to guess the target address of the branch instruction since in the IBM System/370 processor the target address is precisely known when the branch instruction is discovered and decoded at the decode stage of the pipeline. *Emma*, col. 3, lines 28-40. In other words, neither *Hughes*' branch predictor nor *Emma*'s DHT makes a prediction of a branch instruction target address. Rather, *Hughes*' branch predictor and *Emma*'s DHT make a prediction of a conditional branch instruction outcome (also commonly referred to as a branch instruction direction, i.e., whether a conditional branch instruction will be taken or not taken), not a prediction of a target address of a branch instruction. See *Emma*: col. 3, lines 32-36, col. 6, lines 23-25, col. 5, lines 40-53, col. 1, line 59 to col. 2, line 1; *Hughes*: Abstract; col. 3, lines 1-3; col. 10, line 66 to col. 11, line 2; col. 12, lines 15-18; col. 13, lines 58-67 (*Hughes* more often uses the terms "successful" and "unsuccessful" for taken and not taken).

With respect to claim 1, the Examiner states that *Hughes* has taught an op-code type branch predictor that may be substituted for the DHT of *Emma* to result in two branch predictions for unconditional branch instructions. However, claim 1 recites branch instruction target address predictions. As discussed above, neither *Emma*'s DHT nor *Hughes*' branch predictor provides a prediction of a target address of a branch instruction. That is, neither *Emma*'s DHT nor *Hughes*' branch predictor provides a target address of a branch instruction that has the possibility of being the incorrect target address of the branch instruction. Although *Emma*'s DHT and *Hughes*' branch predictor provide an outcome prediction (taken/not taken) that has the possibility of being incorrect, *Emma*'s address generate function (Fig. 10, element 19; col. 9, lines 13-24; col. 16, lines 45-51) and *Hughes* address formulation logic (Fig. 2, element 29; col. 6, lines 12-21, 40-41; col. 10, line 62 to col. 11, line 7) always generate the correct target address regardless of whether the direction prediction is correct or incorrect. Consequently, neither *Emma*'s

DHT nor *Hughes*' branch predictor teach a branch predictor that provides a target address prediction, which is a limitation recited by claim 1.

Furthermore, although *Emma* teaches a branch prediction mechanism that makes two predictions of conditional branch instructions, the two predictions (one by the BHT and one by the DHT) are of the outcome of the branch instruction, not of the target address of the branch instruction. That is, *Emma*'s branch prediction mechanism only makes one prediction of the target address of a branch instruction (by the BHT), whereas the second target address generated by *Emma*'s address generate function and compared with the BHT target address is always a correct target address, as discussed above.

For these reasons, Applicant respectfully requests that the Examiner withdraw the rejection to amended claim 1.

The Examiner rejected independent claims 28, 36 and 45 for the same reasons set forth in the rejection of claim 1. Claims 28 and 45 each recite the limitation of two target address predictions, and claim 36 has been amended to recite the limitation of two target address predictions. Thus, for the reasons discussed above with respect to claim 1, Applicant respectfully requests that the Examiner withdraw the rejection to claims 28, 36 and 45.

In the Office Action of 5/18/2004, the Examiner rejected independent claim 40 (previously canceled and now represented) for the same reasons set forth in the rejection of claims 1 and 2. For the reasons discussed above with respect to claim 1, Applicant respectfully requests that the Examiner withdraw the rejection to claim 40.

With respect to claims 2-27, 29-35, 37-43, and 46-50, these claims depend from independent claims 1, 28, 36, and 45, respectively, and add further limitations that are not obviated by *Emma* in view of *Hughes*. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejections to claims 2-27, 29-35, 37-43, and 46-50.

CONCLUSIONS

In view of the arguments advanced above, Applicant respectfully submits that claims 1-43 and 45-70 are in condition for allowance. Reconsideration of the rejections is requested, and allowance of the claims is solicited.

Applicant earnestly requests that the Examiner contact the undersigned practitioner by telephone if the Examiner has any questions or suggestions concerning this amendment, the application, or allowance of any claims thereof.

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Respectfully submitted,

/E. Alan Davis/

By: _____

E. ALAN DAVIS

Registration No. 39,954

Tel: (512) 301-7234

9/13/2005

Date: _____

Attachments (IDS previously submitted on 12/10/2004 but not considered)